HOBBIES weekly

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★ *FREE design inside*

FOR COFFEE AND SNACKS

FOLDING TABLE

Hobbies

FOR CRAFTSMEN OF ALL AGES

6D

WORLD WAR 1 CURIOSITIES

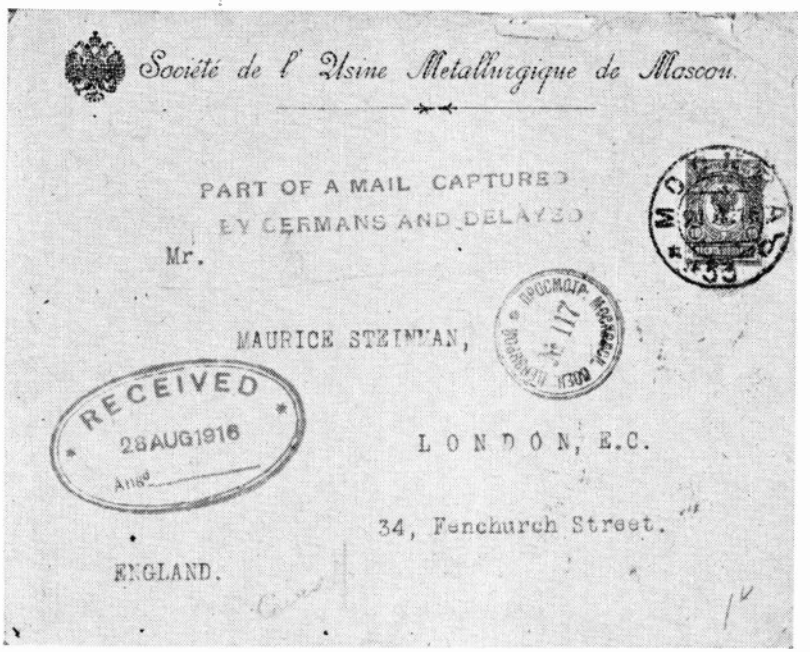
By L. P. V. Veale

IT is now a matter of 50 years since the commencement of World War 1. and during the course of that war there were many very extraordinary changes affecting philately.

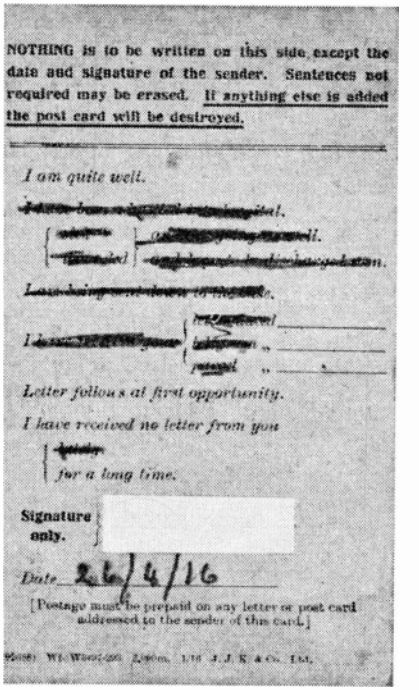
One thing that we should think very curious now in peace time would be to receive a letter which had obviously been opened and sealed down again with a label bearing the words 'Opened by Examiner No.....' yet in those days it was commonplace to have such a letter. The great thing was security.

Anyone wanting to make a War Collection should try to obtain one such envelope at least. It should of course show the postmark very clearly, and a letter which had travelled a very short distance would be of greater interest than one which had gone from one country to another, because it would seem more unusual than ever if the letter had only gone from one town to the next.

So much for the civilian mail, but when we come to the military or for that matter all service mail, matters were much more strict especially when the enemy was close at hand. Mail could easily fall into enemy hands and should this happen then it would be subject to very close scrutiny in the hope of obtaining some information from a careless correspondent. Such mail was obviously very much delayed and the history of the delays can be followed by various postmarks on the envelope.



Posted in Moscow, this letter took over 4 months to reach London


NOTHING is to be written on this side except the date and signature of the sender. Sentences not required may be erased. If anything else is added the post card will be destroyed.

I am quite well.

Letter follows at first opportunity.

I have received no letter from you for a long time.

Signature only.

Date 26/4/16

[Postage must be prepaid on any letter or post card addressed to the sender of this card.]

Field Service Card

Service personnel had to leave their letters open so that they could be censored, by officers, who added a rubber stamp 'Passed by Censor' — generally with a number — and signed it and the letter was sent on its way.

Men who were actually in the trenches would have little chance of getting hold of a clean sheet of paper and an envelope and so 'Field Service Cards,' as they were called, were introduced. They were the same size as a postcard and on one side there were sentences printed such as — I am quite well—I have been admitted into hospital — sick — wounded — and am going on well — and hope to be discharged soon — I am being sent down to the base — I have had no letter from you — lately — for a long time. Then at the bottom there was a space for a signature and the date. These cards were given out to the men and they could cross out the sentences which did not apply.

Next one has to mention the various types of cards etc. that came from the many prisoner of war camps. Generally speaking they are the same in that on one side there is the space for what the prisoner wanted to say and then on the other side the address to which it is to go, the name and the number of the prisoner sending it and the name and address of the camp. Then arising from

● Continued on page 67

Photographing the Display

. . . ON FIREWORKS NIGHT

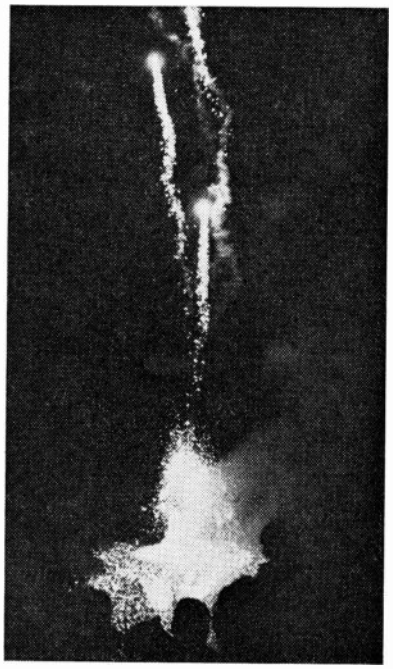
HAVE you ever thought about taking photographs of your fireworks display? Yes, it is quite possible to do so provided that you follow the few simple hints set out below.

In the first place, you need a camera with a lens aperture of at least *f*/5·6 to tackle this job properly. However, the majority of cameras now on sale, even those costing only a few pounds, have a lens of that size.

Next, the choice of film is very important. Colour is by far the best way to record fireworks, as so many of the novel effects owe their attraction to their brilliant shades. You should always use the fastest colour film you can obtain, such as Kodak High Speed Ektachrome or Super Anscochrome, both of which can be bought from many photographic dealers and chemists.

If you propose to use black and white film, probably mainly from the point of view of reduced cost, you should once again choose one of the fastest films available — such types as Kodak Royal X Pan, Ilford HPS or Agfa Record. These materials are all exceptionally high speed and they are ideal for photography under the very low lighting conditions of fireworks night.

Remember to load your camera away from bright daylight or artificial lights, as these films are so sensitive that a slight leakage into the spool or cassette will fog the negative.



Getting a few heads in the foreground improves the picture

By A. E. Bensusan

This is all you will need in the way of equipment and it only remains to put it to good use on the night. Because the effect of fireworks is largely gained through the passage of illuminated particles through the air, it is really the paths of these particles which are photographed. So, the slow speed of 1/25 of a second is really an advantage, as it enables the entire pattern of the firework to be recorded.

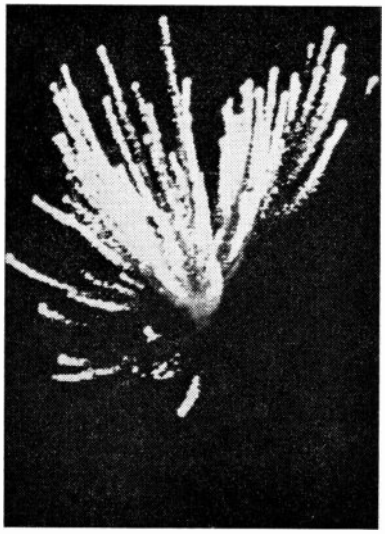
If you were to use a much higher shutter speed, then only a small part of the pattern would be photographed and the effect would be lost. This does mean, however, that the resulting photographs might not look as sharp as those taken in daylight because there is this particle movement to consider.

Since you will quite obviously be able to see the place where the fireworks are to be set off, you can station yourself accordingly. A suitable effect is gained by placing the camera just behind the first row of spectators so that a few heads appear at the bottom of the picture in silhouette form. Then, as the fireworks are set off, and reach their full brilliance, you must be quick to press the button or the opportunity will be lost.

Naturally, if your camera lens needs to be focused at a specific distance, you will need to do this well in advance so that you have nothing else to worry about other than taking the photograph, at the appropriate time.

Fireworks which explode some distance above the ground, for example rockets, need great speed of action if the are to be successfully photographed. Although you can know in advance roughly the path the rocket will take, you cannot be quite sure of the point at which it will explode. So, as soon as you see the burst start to take place, bring the camera up to your eye and be ready to press the button immediately. As a rule, fireworks such as these are best taken with colour film, as they depend so much upon this rather than on their shape.

Try your hand at photographing fireworks this year, but do take the usual safety precautions of standing well away from the point at which they are ignited. It is all too easy to be engrossed in the photographic side, and not be aware of the danger of getting too close!



A rocket burst picture really needs colour to get the full effect

● **Continued from page 66**

STAMP CORNER

those the writer has two covers which were sent to members of the forces, one has 'Returned from abroad — Service suspended' on it and the other 'It is regretted that this item could not be delivered because the addressee is reported prisoner of war.'

Just two final points about such war material before we pass on to the stamps directly. What is the best way in which to keep this very interesting form of philately? If you have a loose leaf album then the best thing to do is to insert some sheets of plain paper and fasten your cards and letters in by means of photographic corners. They make a much better job of it than if you take the cards and try to fasten them in by means of stamp hinges. These are too flimsy for tough material and if you try to use the sticky paper you get around a sheet of stamps you will spoil the letter or card.

VOLUME from the 1-valver previously described can be increased considerably by adding a further valve, as audio amplifier. For this, you will need another valve of the same type (1T4, CV785, W17, or DF91) and a new B7G valveholder. Also a 47k ½-watt resistor, a 0·01μF mica capacitor, and a 1 megohm ½-watt resistor.

4—

AMPLIFIER AND PLUG-IN COILS

By 'Radio Amateur

All connections in the original receiver can be left as they are, except for the lead from R.F. choke to phone socket, which is removed.

Amplifier wiring

The diagram shows all connections to the new valveholder. (The new capacitor C3 can be ignored at this stage, as it has nothing to do with the amplifier.) Connections shown are correct when looking at the valveholders from above, and the new holder is fixed in the same way as the existing holder.

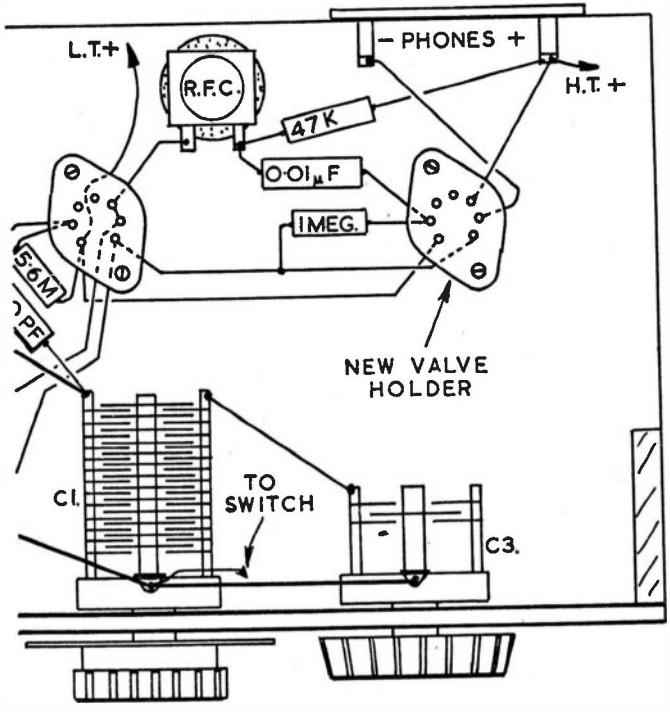
The few connections required are very simple. Resistors are usually colour coded, so 47k will be yellow-purple-orange, and 1 megohm will be brown-black-green. The resistors may also have a silver band.

When connections have been checked against the diagram, the second valve can be inserted, batteries connected, and the receiver operated as before. There should be a good increase in volume. If there is any difference in the valves, the better one should be placed in the detector stage (left-hand holder in the diagram).

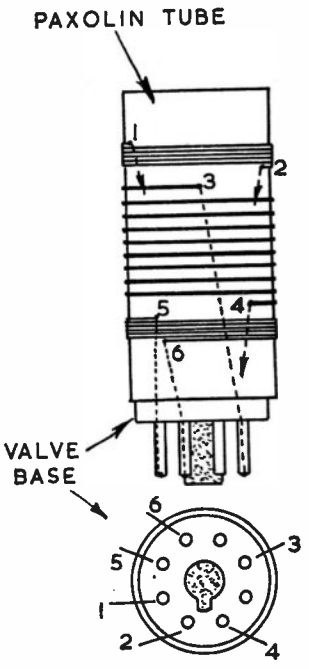
Reduction drive

Tuning with C1 will be much easier if a reduction drive is added. Many different drives of this kind can be purchased. Some fit on the panel. Others are behind the panel, so that C1 will need mounting on a bracket.

On the short-wave bands, tuning is so



Amplifier for 1-valver and plug-in coil



sharp, that the reduction drive will be found of very great help indeed.

Bandspreading

A bandspreading capacitor is sometimes used instead of a reduction drive, or in addition to it. The bandspreading capacitor is a small variable component, C3 in the diagram, wired in parallel with the main tuning capacitor C1.

This can be done, either with the 1-valver or 2-valve set, by moving the on/off switch to another position on the panel. The switch may go under C1. C3 can then be fitted in the switch position.

If C1 is 150pF, and C3 is 15pF, the full 180 degrees rotation of C3 is the same as turning C1 about 18 degrees. So tuning on C3 is as easy as if a 10:1 reduction drive were placed on C1. There is also the advantage that C3 allows a narrow band of frequencies to be tuned, and dial readings noted. This is exactly what is wanted, when listening on the 19, 25, 31, or other commercial bands, or exploring the amateur bands.

If possible, C1 should have a 0–100 or 0–180 scale, with a sharp pointer or line, so that it can be accurately re-set. C3 should also have a dial or scale. When a band has been located, the setting for C1 is noted. The readings of stations heard can then be put down for C3. It is then possible to find stations again. Capacitors used for bandspreading vary somewhat, but a value of 10pF or 15pF is usually satisfactory.

In some expensive receivers, a reduction drive is fitted to the bandspreading capacitor, to make tuning very easy. C1 is called the bandsetting capacitor.

Plug-in coils

These were mentioned before, and the diagram shows how old valve bases can be employed. Several old valves of the same kind are wanted. The glass bulbs can be broken off while holding the valve inside a strong cloth.

Leads from the valve are usually soldered at the tips of the base pins. The leads can be pushed or pulled out, while softening the solder with a soldering iron. The holes in the pins can be cleaned with a wire, needle, or very small drill.

The Paxolin tubes are a very tight fit on the bases, or can be packed to fit with paper. Spread cement on the base, paper and inside of the tube. Or each tube can be fixed with two small 6BA or 8BA bolts, which are in holes drilled straight through the tube and valve base rim.

The coils can be wound as already described, or coils can be made by trial. Successful coils are easily made if it is remembered that the wavelengths tuned depends on the number of turns between points 3 and 4. To increase the wavelength, use more turns, and vice-versa. For up to 60 metres or so, space the wire by about its own diameter. The winding from 5 to 6 is reaction, and is generally about two-thirds the number of turns employed between 3 and 4. Any insulated wire of about 26 s.w.g. is suitable, with turns side by side. The top winding is for aerial coupling, and can be about one-third to one-half the number of turns on the tuned winding.

Take the ends through small holes, and down through the valve pins. The wire is soldered at the tip of the pin, and cut off.

Similar ready-made formers can be purchased, to wind. Ready made plug-in coils for most wavebands may also be bought.

Using 20 s.w.g. wire, spaced by the wire diameter, on a 1¼ in. diameter former, tuned windings for various bands can be as follows:

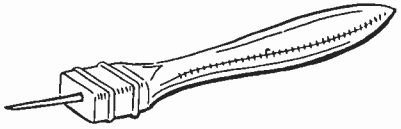
14–31 m, 7 turns. 20–45 m, 11 turns. 25–52 m, 15 turns. 28–60 m, 18 turns. C1, 150pF.

For 24 s.w.g. wire, turns also spaced by wire diameter, on a 1¼ in. diameter former, tuned windings may be:

23–50 m, 11 turns. 32–70 m, 17 turns. 36–80 m, 22 turns. 45–100 m, 30 turns.

A HARD-POINT SCRIBER

EVEN the best paint brush will one day cease to be useful, but do not throw away the handle, which can be used again for another purpose. The ½ in. size paintbrush is particularly useful.



Cut off the remaining hairs, and drill a $\frac{3}{32}$ in. hole as straight as possible a little way into the end. With a sharp knife split down the hole, and shape out a section to take the head of a masonry fixing pin such as sold now for wall fixings, and which are very hard. Apply glue under vice pressure, and if you have a brass ferrule to size, this will complete a very handy tool. (E.)

Buying a House

By Lord Meston

THIS book is an authoritative guide to all aspects of house purchase. It covers everything from obtaining the initial finance to appeals against rates.

The laws concerning the buying and selling of property are complex, and many people can be adversely affected by ignorance or the temptation to take a chance. The aim of this book is to eliminate mistakes and to ease anxiety of young home buyers.

Published by Geo. Newnes Ltd., Tower House, Southampton St., London WC2. Price 3s. 6d.

CHEMISTRY AT HOME

SOLUTIONS of ferrous sulphate $FeSO_4.7H_2O$, should always be freshly made up. On standing for any length of time they absorb oxygen, O, from the air. Ferric sulphate, $Fe_2(SO_4)_3$, and various basic ferric sulphates form. This can lead to confusing results, especially so where ferrous sulphate is used as an analytical reagent.

2—Experiments in Ferrous Sulphate

Pure ferrous sulphate gives no colouration with ammonium thiocyanate solution, NH_4SCN, whereas ferric salts give a red colouration. This therefore gives a method of testing a solution of ferrous sulphate for freedom from ferric sulphate. To a few ml. of a solution of ferrous sulphate which has stood for some time add a few drops of ammonium thiocyanate. A pink or red colour will appear according to the extent of decomposition due to the formation of soluble ferric thiocyanate:

$Fe_2(SO_4)_3 + 6NH_4SCN =$
$2Fe(SCN)_3 + 3(NH_4)_2SO_4$ (ammonium sulphate).

Much more stable in solution is a double salt of ferrous sulphate.

This is ferrous ammonium sulphate, $FeSO_4.(NH_4)_2SO_4.6H_2O$. For most analytical testing purposes its solution reacts just like ferrous sulphate and remains free from ferric salts for a considerable time.

To prepare a specimen for stock use powder separately 3·96 grams of ammonium sulphate and 8·34 grams of ferrous sulphate. Dissolve each in the smallest possible volume of warm distilled or boiled and cooled filtered rainwater at a temperature not above 40 degrees Centigrade. Mix the two solutions, add a drop or two of dilute sulphuric acid, H_2SO_4, and let the solution cool down overnight. Fine bluish-green crystals of ferrous ammonium sulphate will have separated out. Drain off the mother liquor and drain and dry the crystals on a clean porous brick.

The relative instability of ferrous sulphate due to oxidation is also shown by other ferrous compounds and can indeed be put to good use. Ferric hydroxide, $Fe(OH)_3$, for instance, can be made direct from ferrous sulphate, by the oxidation of ferrous carbonate, $FeCO_3$.

Dissolve 13·9 grams of ferrous sulphate and 4.2 grams of sodium bicarbonate, $NaHCO_3$, each in 50 ml. of water. Mix the two solutions. No apparent change occurs for a few seconds owing to production of soluble ferrous bicarbonate, $Fe(HCO_3)_2$, and sodium sulphate, Na_2SO_4:

$FeSO_4 + 2NaCHO_3 =$
$Fe(CHO_3)_2 + Na_2SO_4.$

Then the liquid darkens, a dingy white precipitate of ferrous carbonate makes its appearance and effervescence occurs owing to evolution of carbon dioxide, CO_2:

$Fe(HCO_3)_2 = FeCO_3 + H_2O + CO_2.$

Let the whole stand until effervescence ceases. This requires some hours. Filter off the ferrous carbonate. Atmospheric oxygen, O, causes it to turn brown on the surface due to formation of ferric hydroxide:

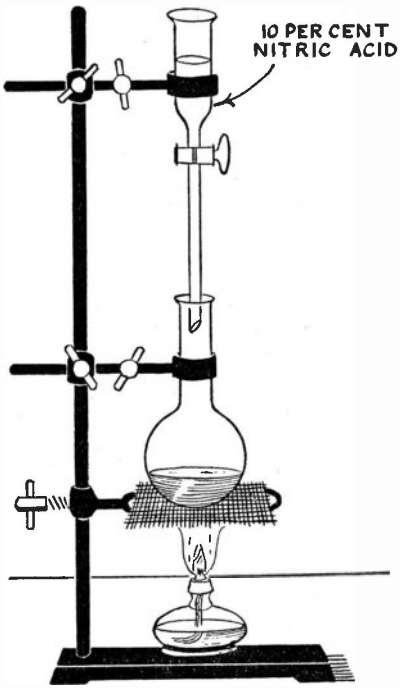


Fig. 1—Ferric sulphate from ferrous sulphate

$4FeCO_3 + O_2 + 6H_2O =$
$4Fe(OH)_3 + 4CO_2.$

The residue on the filter must now be freed from sodium sulphate. This is done by washing it on the filter until one wash water no longer gives a white turbidity with a solution of strontium nitrate, $Sr(NO_3)_2$. The residue may now be dried in the domestic oven, when the change to ferric hydroxide is completed.

This behaviour lies behind the rusty coloured springs one sees in the countryside. Soluble ferrous bicarbonate in the water oxidises to ferric hydroxide on exposure to the air.

Ferrous sulphate may also readily be oxidised to ferric sulphate under certain conditions and this serves as a means of preparing the latter salt. A boiling solution of ferrous sulphate containing free sulphuric acid is oxidised with nitric acid, HNO_3:

$6FeSO_4 + 3H_2SO_4 + 2HNO_3 =$
$3Fe_2(SO_4)_3 + 2NO + 4H_2O.$

As the evolved gas nitric oxide, NO, at once unites with atmospheric oxygen to form nitrogen peroxide, NO_2:

$2NO + O_2 = 2NO_2,$

the experiments should be conducted in the open air, for nitrogen peroxide is harmful if breathed.

Use the apparatus shown in Fig. 1. Into the 250 ml. flask pour 12 ml. of 10 per cent sulphuric acid, add 6 ml. of water and boil. Dissolve in this 10 grams of ferrous sulphate. Then a few ml. at a time add a 10 per cent solution of nitric acid. The solution becomes dark brown. Then there is a sudden but short evolution of gas, the liquid paling to yellow-brown. Test a drop of the solution with potassium ferricyanide solution, $K_3Fe(CN)_6$. If a blue precipitate appears, ferrous sulphate is still present. The blue precipitate is potassium ferric ferrocyanide, $KFe[Fe(CN)_6]$:

$FeSO_4 + K_3Fe(CN)_6 =$
$KFe[Fe(CN)_6] + K_2SO_4$ (potassium sulphate). Further additions of nitric acid must be made to the boiling solution in the flask until the blue precipitate is no longer obtained by the ferricyanide test.

The solution of ferric sulphate may now be evaporated to dryness in an evaporating basin. It is obtained as a cream coloured mass. As it is deliquescent, no time should be lost in bottling it, preferably while it is still warm. Use a screw-cap bottle fitted with an extra disc cut from sheet rubber, so as to give an airtight seal and prevent atmospheric moisture reaching the salt.

Every coal user will have noticed brassy material in coal from time to time. These 'coal-brasses', as they are sometimes called, are a variety of iron pyrites known as marcasite, consisting of iron disulphide, FeS_2. Though a source of annoyance to the householder

if present in large amounts in coal, it is not wasted industrially. By the action of air and rain several reactions occur, ferrous sulphate is one of the products and the whole is worked up for the industrial manufacture of ferrous sulphate.

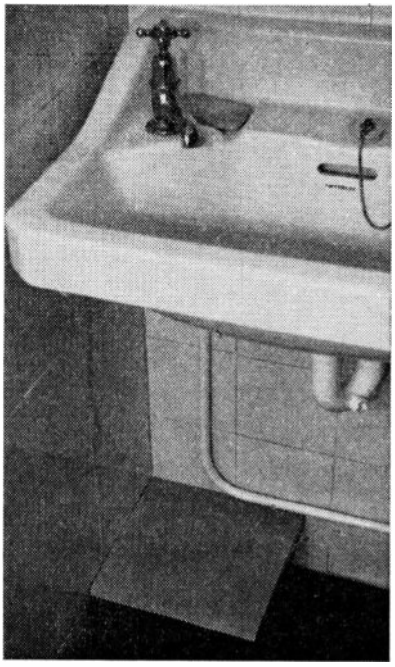
Fig. 2—Ferrous sulphate from 'coal-brasses'

While it would not be worth while to prepare one's own supplies by this method, it is interesting to note the formation. Rig up the apparatus shown in Fig. 2. Plug the stem of the funnel lightly with cotton wool. In the funnel put some crushed coal containing a good proportion of marcasite. Set the apparatus in the open air for two or three weeks. When a fair amount of rain water has percolated through into the bottle test a sample with potassium ferricyanide solution. A blue precipitate of potassium ferric ferrocyanide forms, showing the presence of much ferrous sulphate.

Alarm is sometimes felt when a piece of coal in the grate decides to explode and scatter pieces all over the room. If one examines one of the thrown out fragments it will generally be found to contain marcasite. Some specimens of marcasite contain pockets of highly compressed carbon dioxide. Heat causes a great rise in pressure. An explosion results. Consequently, coal containing large masses of marcasite can be quite dangerous in the grate.

Make a Handy Shelf for your Bathroom

A SMALL and unobtrusive shelf is a great asset in most bathrooms. During the summer, when the normal water heating system is not in use, the shelf can be used to accommodate a kettle of hot water. Alternatively, it is just the place for standing those few essential items of cleaning materials.



By A. E. Bensusan

Since most bathrooms have a great restriction on the space available, an ideal spot for locating this shelf is usually beneath the wash handbasin, but the shelf must be small enough to prevent it being kicked, and becoming a nuisance, when standing at the basin.

Additionally, the top surface must be of a heat resisting material, capable of withstanding the temperature of a kettle of hot water, and permitting it to be easily cleaned. An ideal arrangement is that shown in the photograph. As can be seen, the shelf fits neatly into the corner of the wall, is well above the floor (an important point to enable the floor to be cleaned properly), and is clear of the water pipe sufficiently far to allow painting to be carried out without spoiling the surface of the shelf.

The principal material needed is a 12 in. square of timber approximately ¾ in. thick, but modification of these sizes may be made to suit individual requirements. The top face is surfaced with Warerite, Formica, or some similar melamine plastic. This material, in such a small size, can usually be obtained as an offcut from a local handicraft shop for about 1s. 0d. When bonding the surface to the timber, take care to spread the adhesive evenly right out to the edges, or the two pieces will tend to come apart after some time.

In the writer's case, it was possible to obtain an offcut of exactly the same colour as the paintwork of the bathroom, so enabling the painted edge of the timber section of the shelf to blend nicely. However, a contrasting colour could also be employed to good effect.

The shelf is attached to the wall by means of two 4 in. pressed steel brackets. These can be obtained ready finished in a battleship grey colour and, as they are hidden from a normal standing position, they require no repainting. Locate the brackets so that they come approximately one third of the way in from the open edges of the shelf, to gain the maximum stability.

The best way to obtain accurate fixings is to measure up the required height from the floor on both walls, carefully drill and wallplug the brackets in position, and then lay the shelf on top. Hold it firmly into the angle of the walls, and use a short pencil stub to mark upwards through the top holes in the brackets on to the timber. Remove the shelf, drill shallow holes of slightly less diameter than the screws, and then replace it in position. The screws can be inserted upwards with a short screwdriver.

HERMAN'S HERMITS

RECORD producer Mickie Most (with hits by The Animals and The Nashville Teens to his credit) obtained a hat trick with Herman's Hermits, one of the most popular young groups from Manchester.

Herman (real name Peter Noone) is 16 years old and was quite successful as an actor, appearing in several TV shows, including 'Coronation Street'. Mickie Most saw them, signed them, recorded them and got their disc released in the space of three weeks, when it quickly topped the hit parade. Titles —'I'm Into Something Good' and 'Your Hand in Mine' (Columbia DB7338).

WATER MAKES PAPER 'BLUSH'

INVISIBLE writing that reappears blue by the fireside, blue paper that 'blushes' pink under water, and a weather indicator that stays blue in fine weather and then turns pink when rain threatens; all these have a secret in common — cobalt chloride.

By A. E. Ward

You can buy the chemical in the form of dark red crystals; but you must keep the substance well covered, because the crystals are 'deliquescent'. This means they easily absorb moisture from the air and soon become wet and messy.

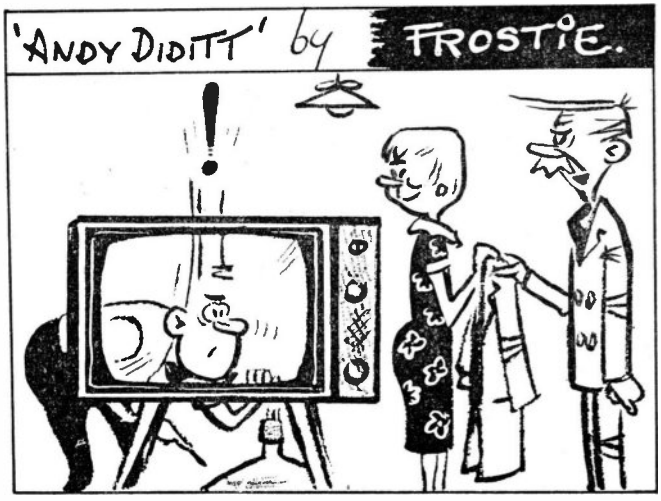
Dissolve a few crystals in half an eggcupful of water, to make a pale pink 'invisible ink'. If you write with the ink, using a clean pen, the letters should be nearly invisible on white paper and completely invisible upon pink-tinted paper.

Warm the writing to make the cobalt chloride lose its water of crystallisation and turn blue. Breathe on the paper to supply water vapour from your breath and make the writing vanish again.

A piece of white blotting paper soaked in the solution then coloured blue by drying, will turn pink when dipped in water. A chemist can use this paper to help him decide whether drops of any colourless liquid are really water.

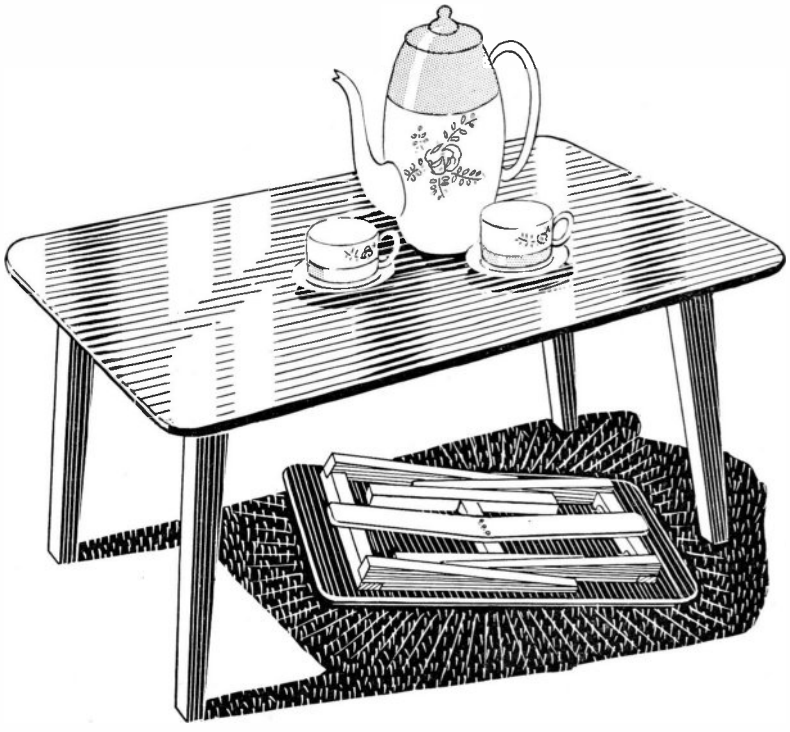
Then you can make the weather indicator by dissolving a teaspoonful of salt and twice as much cobalt chloride in half a cupful of water.

White blotting paper soaked in this solution and dried will remain blue in dry fine weather, but will absorb atmospheric moisture to become pink, as a sign that rain might be on the way. Pin up the paper in a sunny place, where fresh air can circulate freely around it.



Instructions for making

FOLDING COFFEE TABLE



THERE are occasions, such as when entertaining several people in your home, when an additional table on which to stand the sandwiches and refreshments is more or less a necessity. The coffee-table shown on the front page will serve this purpose admirably, because when not in use it can be folded flat and stowed away.

Hobbies Kit No. 3595 for making this handy Occasional Table contains all the necessary wood, hinges and screws, including veneered panel for the top. Kits from branches, etc., price 36/3, or direct from Hobbies Ltd., Dereham, Norfolk (post 3/6 extra).

With the legs reduced in length to about 12 in. its use as a bed table for an invalid or for any one having a meal in bed is apparent. The table will also serve as an attractive permanent piece of furniture. Its dimensions are 30 in. by 15 in. and it stands about 18 in. high. It has been designed so that the legs are hinged in pairs, one pair folding between the other.

The legs are held in the open or closed position by a central strut, which gives a spring action.

The top consists of a veneered panel which is contained in Hobbies kit. This also includes sufficient stripwood, hinges, and screws etc, to make a successful job. The make-up is quite simple and there are no difficult joints to worry even the amateur.

Study the diagrams on the design sheet, which gives all the information required for making the occasional table. All parts are lettered in conjunction with the instructions to facilitate construction.

First of all cut four legs A to the full size and shape shown on the design sheet. Cut and clean up the rails B and C shown in Fig. 1 and assemble the legs and rails in pairs, halving them together as seen in Figs. 2 and 3. Glue the joints and strengthen with screws. Note that the top edges of rails B and C are planed off flush to conform with the slope of the legs.

Now glue pieces D and E centrally to the underside of the veneered panel Fig. 4. Screws should not be used for this fixing. Next hinge the two pairs of legs to the underside of the panel as seen in Fig. 5. One pair of legs is, of course, wider than the other to enable them to lie flat. It would be advisable to countersink the screwholes in the hinges to obtain a neater finish.

The strut F, consisting of 3 in. by $\frac{3}{8}$ in. stripwood, is now cut to length and screwed to piece D as shown in Fig. 5.

A very durable finish can be obtained with Furniglas polyurethane varnish after staining. Other workers may prefer to use french polish or Furniglas Hardset, which is a heat-resisting polish.

The Wonders of Nature revealed

USING YOUR MICROSCOPE

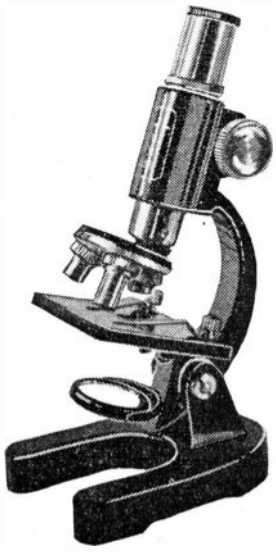
THE human eye is a wonderful instrument in itself. Its lower limit of vision lies at the diameter of a full stop on this page. Yet in objects no bigger than that there are intricate and fascinating details.

Acquiring a microscope is like gaining a passport to a wonderful world denied to normal vision.

The professional scientists' microscope is an expensive instrument with refinements and capabilities which require extensive experience and skill to operate efficiently. Disease germs are defeated by studying their activities under the microscope. Biologists, chemists, metallurgists, geologists solve many of their problems by magnification, and even the very secret of life has been revealed.

The ever-increasing use of the microscope in science and of the public curiosity in its revelations has led enlightened optical instrument makers to manufacture inexpensive but efficient microscopes which are simple to operate, thus giving students and amateurs of moderate means the opportunity to see what the unaided eye cannot see.

Student or amateur — both benefit; the student by extension of knowledge of his subject and the acquirement of experience before passing to his professional instrument, the amateur by starting a hobby which can be of lifelong interest.



The swivelling turret gives a choice of three magnifications

General construction

For the amateur a great deal can be learned of the minute details of insects, moulds, plant and animal cells, textile fibres. Indeed, the variety of material is so wide and so common that you need never be at a loss for something to study. When you see with what efficiency minute objects are constructed you will be filled with a sense of awe.

The essentials of the microscope are a firm base, a mirror for directing light through the specimen, a stage to hold a glass slide bearing the object under examination and a moveable magnifying system mounted in a tube.

The magnifying system consists of at least two lenses, known as the objective and the eye-piece. The objective lies nearest the specimen; the eye-piece at the top of the tube.

The objective gives an initial magnification, just like a magnifying glass. This is then magnified still further by the eyepiece. By turning the milled wheels at the sides of the tube the lens system is raised or lowered in order to focus sharply.

The greatest care should be taken of the lenses. Cleaning should only be done when absolutely essential. Objectives and eye-pieces should be unscrewed as little as possible for fear of introducing dust.

For cleaning use if possible a piece of old soft natural silk, wiping gently. Store the silk in a closed jar to keep off dust. If silk is not available, use the softest piece of cloth you can find. Should gentle polishing not clean completely, slightly damp the cloth with methylated spirit.

When not in use the microscope itself should be kept covered with a plastic bag or in its box so as to keep it as dust free as possible.

How to adjust

The microscope may be used in the upright position, but it is generally more comfortable to use in an inclined position, which is produced by tilting the metal column holding the lens system tube. For wet specimens however, use the upright position, otherwise the specimen will flow.

Set the instrument facing a window or reading lamp. Look through the eyepiece and turn the mirror until a bright circle of light is seen. This is known as the field. Put a specimen slide (or a hair between two glass slides) on the stage and clamp by means of the spring clips on the stage.

Raise and lower the objective by means of the milled wheels on the tube until the specimen is in sharp focus.

Illumination

Some models have built-in illumination, using small dry batteries. In one type a concealed bulb throws up light from the mirror and in another the mirror is reversible, bringing a spotlight into operation. In both types the mirror may of, course, be used in the usual way with an outside light source.

Good illumination is essential, especially with higher powers. So the brightest field possible should be obtained before examining specimens.

Though emphasis has been given to illumination many beautiful effects may be seen by tilting the mirror so as to lessen illumination or even to cut it out completely. Cross light from a natural source or focussed by a magnifying glass on to the specimen instead of through it may reveal significant details. With opaque specimens this is, of course, the obvious method.

Magnification is expressed as 50x, 100x, 200x and so on. This means that an object is magnified 50, 100 or 200 diameters.

It is best to start with a low magnification so as to have a general view of the field and to be able to select the most suitable part for examination under progressively higher powers. The longer the objective the higher magnification it will give. Although some microscopes mount only one objective, involving change of objective for each higher magnification, many have 'turrets' which mount three or more. Simply by turning the turret all objectives can successively be brought into use by a flick of the fingers.

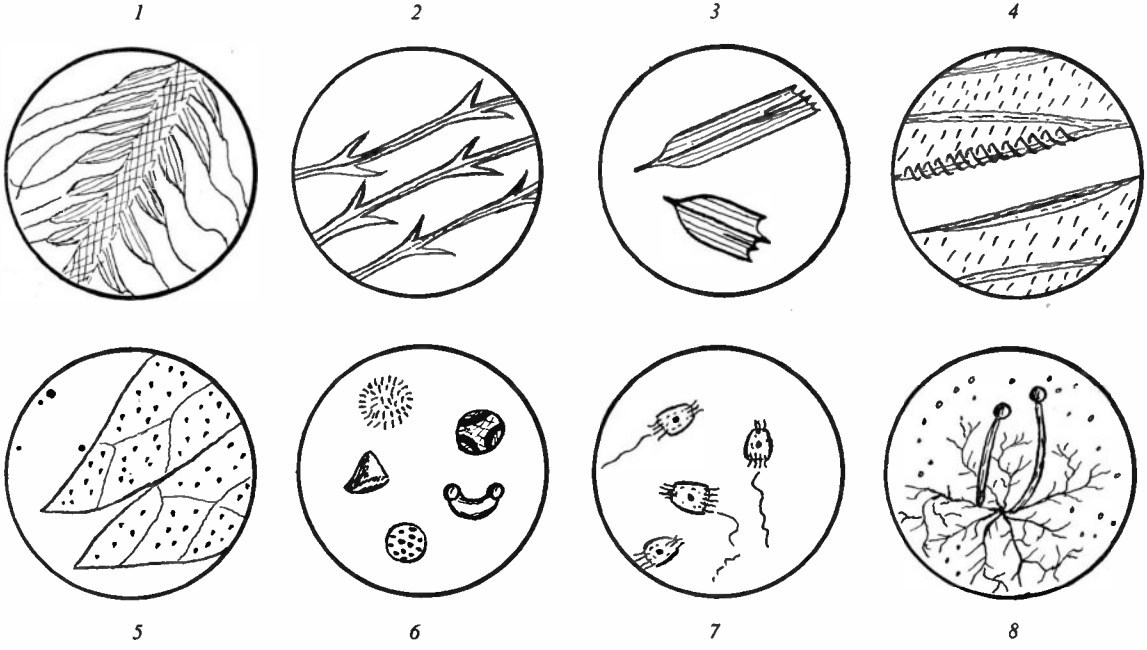
A final point is worth making before passing to general use of the microscope. This is that you should train yourself to work with both eyes open. Keeping the unengaged eye screwed up tight results in eyestrain. Though a little difficult at first you will soon get used to concentrating the attention through the microscope only.

Looking at Everyday Things

Good practice in focussing and general observation can be had by laying a human hair and various textile fibres on a glass slide, covering with another slide and clipping them on the stage. Note the differences between the hair and each type of fibre. The diameter of an adult human hair is one five-hundredth to one thousandth of an inch. This will give a rough guide to other sizes.

Once you are the proud possessor of a microscope you can go right ahead with studying the Wonders of Nature. The simple experiments described here cannot fail to hold your interest and there is plenty of material available in everyday things to keep you deeply engrossed.

Lay both wings from one side of a wasp between two slides. A low power shows the webs between the stiffening veins to be covered with short, sharp, upstanding hairs. Look carefully along the edges of both wings. On one you will find a row of hooks. In the corresponding position on the other will be found a ledge (Fig. 4). In flight these hooks interlock with the ledge to form one broad wing. A similar arrangement will be found on bee wings.



Feathers

Strip off one of the tiny barbs from the shaft of a feather and examine it as before between two slides. What appears to the naked eye as a fibre is now seen to have further fibres running from it and from these fine hairs (Fig. 1). Examination of these hairs show they bear barbs or hooks according to the type of feather. Interlocking of these barbs traps air and gives a close matted surface to the bird which keeps in warmth and in the case of water birds aids buoyancy.

Interesting variations will be discovered in the barbs of feathers from different species of birds.

Seeds

If you wish to know why the wind blown dandelion seed clings so persistently, look at the hairs of the parachute under low and high powers. These hairs are covered with short sharp spikes which catch on to solid objects and so anchor the seed for germination (Fig. 2).

Insects

Insects provide interesting material. The wing of a clothes moth will be seen to be covered with overlapping scales. Tap a clothes moth on a slide. A few wing scales will be detached. They are paddle-shaped and covered with longitudinal lines, as well as having a central shaft (Fig. 3).

To the naked eye wasp legs look smooth and shiny. Examine one under a low power. It will be seen to be rough and furry with long hairs growing out of it. On a bee's leg the long hairs are absent. there is only a short spiky stubble; Tease off a small portion of a dead bee's body with a needle. The body hair consists of long fibres covered down their length with tiny barbs.

The various minute flies we loosely dismiss as 'midges' quickly show wide differences under the microscope. The window sills usually provide a few dead specimens. Their feelers or antennae

are wonderfully intricate, varying from species to species. Move the slides about to bring all parts of the insect into view. Striking facts will almost always come to light.

The wings of butterflies — even pale winged species — give colourful effects. Fish scales, too, are of interest, for these are finely lined.

Living cells

Passing from such relatively large objects, we come to living cells. Tear a leaf and examine the ragged edge. Choose the thinnest part for observation. The cells show up well.

An even better object to look at is a small leaflet from the tip of some moss, for moss leaves are only one cell thick and so we see the cells clearly. There are many kinds of moss and their structures vary somewhat under the microscope. Under high magnification green specks known as chloroplasts are visible (Fig. 5).

Yeast

With yeast cells one can watch cells growing. If wine is being made in the house, take a drop of the fermenting liquid and cover it preferably with a glass cover slip, or if this is not available with a ½ in. circle cut from stiff plastic film. Low magnification shows the teeming yeast cells, which are oval in shape.

Increase the magnification to your highest power. Some cells have buds. These grow to the size of the mother cell and bud again, separating if disturbed. Steady repetition of this process shows why yeast increases. It is feeding on the sugar in the liquid.

Gently scrape the inside of your cheek with a spoon. Stir the scraping in a few drops of water. Put a drop on a slide, cover it and see what you can find. Transparent cheek cells come into view — more easily perceived by diminishing the illumination.

Step up the magnification. A central darker area will be apparent within each cell. This is the nucleus from which by a wonderful chemical process the growth and characteristics of new cells is directed.

The vast variety of cells, both plant and animal, is produced by such nuclei. Liver cells, brain cells, skin cells, and so on, all have their own type of chemical process for producing their own type of cell.

Pollen

Pollen seems to be just yellow dust. The microscope shows pollens to be tiny grains of extraordinary variation in shape and markings from flower to flower (Fig. 6).

Pollen study can keep one busy for a very long time. If you turn over a fern leaf you will find during the growing season small red-brown dots. These are known as sori and they are the spore-producing organs of the fern. These, too, are interesting and beautiful objects under the microscope. Flower petals, stamens and other parts are all worth examining.

Pond life

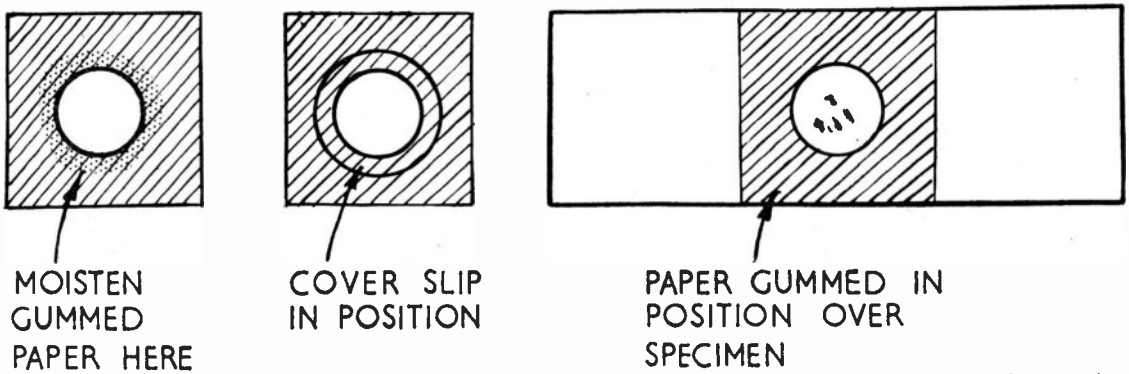
Freshwater life, too, affords great variety. A drop of pond water or mud from the bottom contains all sorts of busy creatures. Even water from a vase of flowers, especially if it has been standing for a week or so, will almost certainly show vorticella — tiny creatures which scurry to and fro (Fig. 7).

Moulds appear as intricate threads topped with small spheres (Fig. 8). These spheres are spore cases and one will probably have disturbed some of the spores. The latter will be seen as tiny granules scattered through the field.

To examine mould satisfactorily take up a tiny fragment, place it in the centre of a slide, add a drop of methylated spirit, tease out the mould with a needle and then drop on a cover slip. Moulds from various sources show much diversity of form.

The above suggestions indicate the wide field for the amateur microscopist. Having tried some or all of these experiments you may find a particular field attracts more than others. By all means specialise in it, even if only for a time. You cannot fail to learn a great deal.

HOW TO MAKE YOUR OWN SLIDES



The making of permanent slides is an advantage for reference purposes.

Though slide making can be expert business involving section cutting, hardening, staining and mounting in various media, there is simple introduction to the art.

Comparatively 'dry' specimens, such as insect and plant parts, crystals, fibres and so on can be mounted by a process needing no skill. This consists in the cutting of a square of gummed paper the width of the slide and of cutting a hole in the centre. Moisten the gum around the central hole and put on a cover slip. Having arranged the specimen in the middle of the slide, moisten the rest of the gummed side of the paper and press it into place over the specimen, which will then be held behind a small circular window as shown above.

Slides should, of course, be labelled. A small square of gummed paper at one end bearing the name of the specimen is all that is required. A surprisingly large collection of slides can be built up by using this simple method.

For more advanced manipulations, books on the subject will help and materials may be had from microscopists' dealers.

Once embarked on microscopy it will almost certainly become a firm pursuit, for the wonders of Nature are endless.

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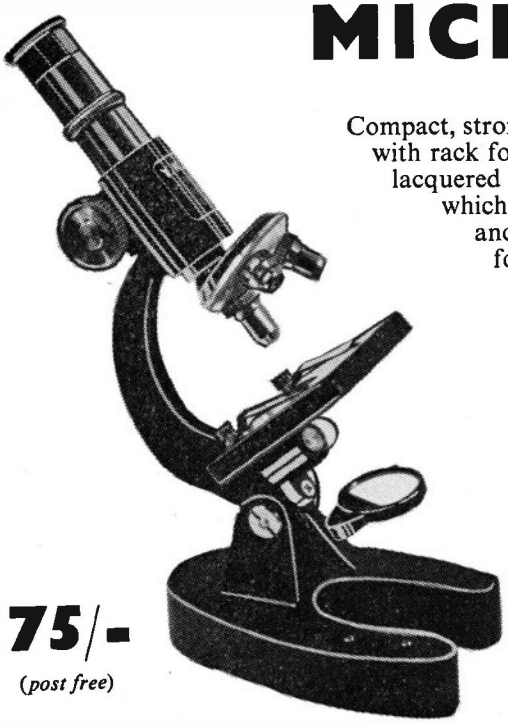

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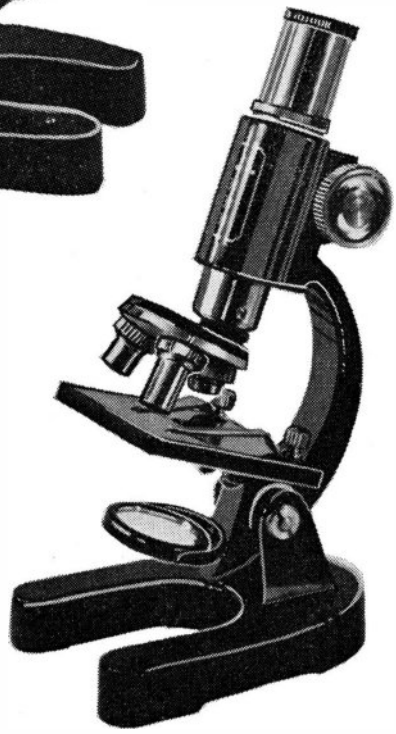

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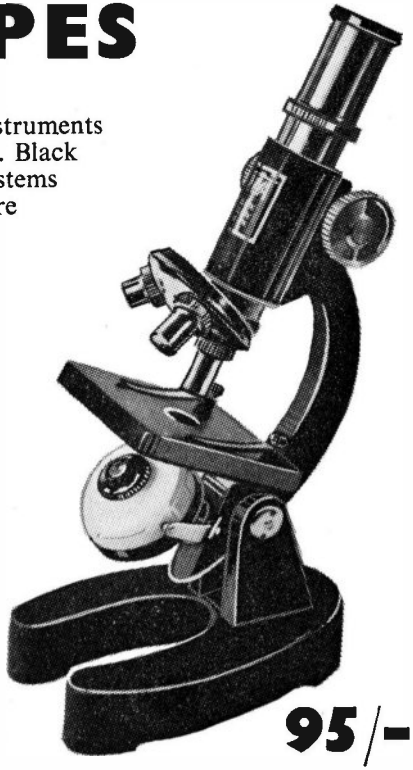

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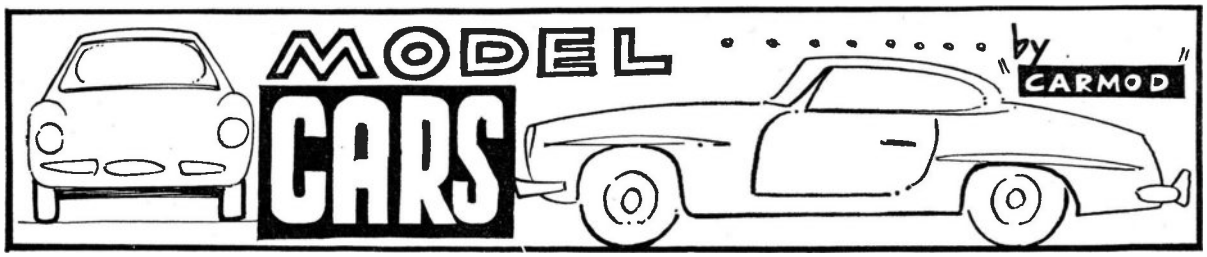


THE LOTUS SEVEN

IT is remarkable that no die-cast miniature of the Lotus Seven has been made. This car and the Morgan (another vehicle which does not seem to have inspired the model manufacturers) are the last of what many people consider to be the classic sports cars.

My Lotus Seven model is a hybrid, using two production miniatures which are, unfortunately, slightly difficult to obtain. These are the Dinky M.G. Midget which, although out of production, can still be found in toyshops, and the Lotus 18 Formula 1 car made by Solido of France. These are on sale in Britain in certain shops but if any difficulty is experienced they can be ordered from Charlier-Niset, 7, Rue du Chemin de Fer, Wavre, Belgium.

This is a radical chopping, taking a considerable time and demanding a degree of self-confidence which can be acquired only by experience. It is not a project to enter into lightly but the result is most rewarding.

The easiest part of the chopping is the work on the Solido Lotus, which consists only of sawing off the nose of the car 21 mm. from the front. This is the only part of the Solido model to be used, which may seem wasteful but the remainder can later be used for another chopping (Stirling Moss' 1961 Lotus using the nose of the Dinky model of the Lotus 22).

Remove the base plate and set aside the Lotus front end to commence work on the Dinky M.G.

1. Take off the base plate and wheels by filing off the button ends on the underside of the car.
2. Make a hacksaw cut across the top of the bonnet 13 mm. in front of the windscreen and continue this cut down to the mudguards.
3. Saw off the front bumper as close as possible to the front edge of the mudguards.
4. Cut along the lines where the mudguards meet the bonnet until these cuts meet the incision described under 3. Remove the front end of the bonnet.
5. Cut out the entire rear part of the body, including the seats, by two incisions along lines formed by the inside edges of the body behind the seats. This is best done by starting from the inside of the car between the seats and the body sides.
6. Cut off the ends of the rear mudguards by 9 mm.
7. Remove steering wheel and file flat the top of the bonnet behind the windscreen so there is a level surface from front to rear.
8. Cut into the mudguards on each side 19 mm. forward of the front edge of the rear mudguards. File away all the metal between these cuts and the rear mudguards.
9. File off the front of the mudguards so as to leave 32 mm. of metal on both sides of the car. File off door and bonnet lines.

What remains of the Dinky model will then look like Fig. 1.

The next step is to 'flare' the front mudguards by filing to shape shown in Fig. 2.

The front end of the Lotus may now be put into place. This should join exactly, but some filing of the sides will be needed. Cement in position and fair in with Plastone. Build up, with the same material the instrument panel 3 mm. behind the original. Refit steering wheel while the Plastone is still soft. Fill in the slot left by the original windscreen. File body sides to the shape shown in Fig. 4.

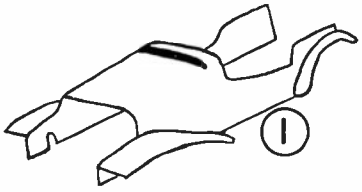
The back of the body can now be built up with cardboard or thin aluminium sheet to the shape shown in Fig. 5. and a reinforcement is given to this by an inside edge of Plastone.

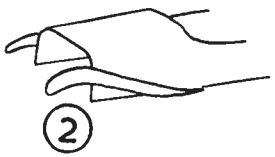
At this stage the base plate and wheels can be refitted. It is necessary to cut the baseplate to enable it to fit the reshaped car. It is also needed to file or cut a slot in the body to accommodate the rear axle.

The seats of the M.G. should be cut away, trimmed up and the driver removed, filling up the hole left by the driver.

An exhaust pipe, formed from PVC covered electric flex wire, is cemented into place under the mudguard and along the near side of the car.

This, apart from painting and the provision of a driver's small windscreen, completes the model in its racing trim. Suggested colour: aluminium with black nose and black racing number discs.





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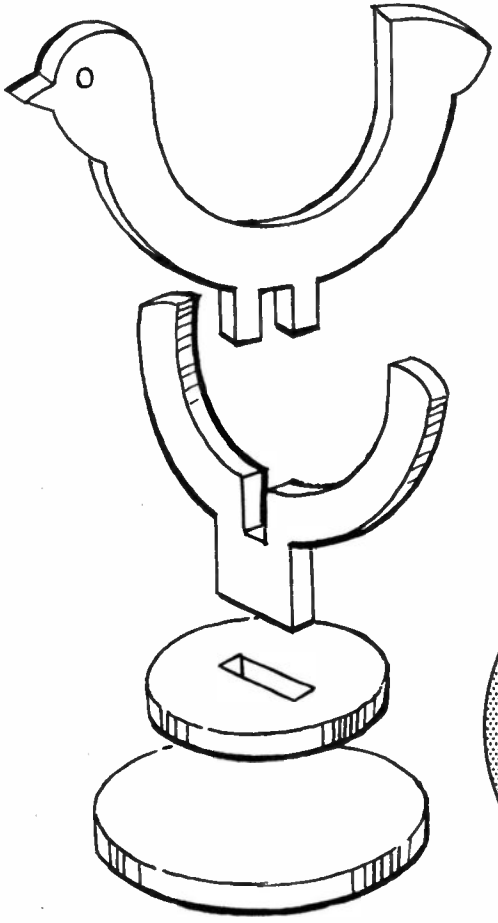
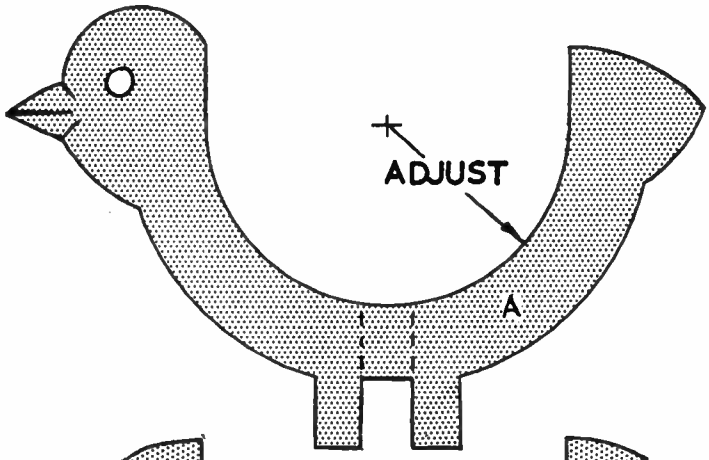
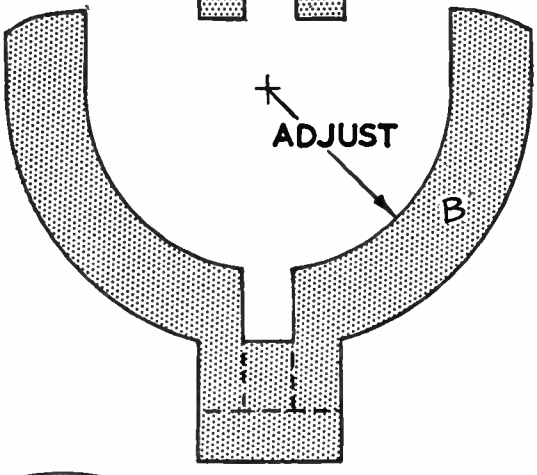
THIS easy-to-make egg cup consists of only four parts (A, B, C and D), all of which are cut from ¼ in. wood using a fretsaw. It is a simple matter to trace and transfer the patterns to wood by means of carbon paper.

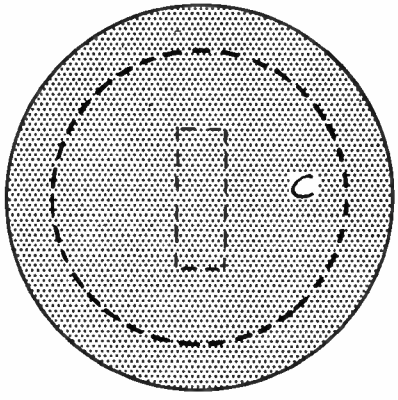
Owing to the great difference in size between large and small grades of eggs it is suggested that the interiors of A and B are adjusted, when drawing out, to suit the grades normally used in the household.

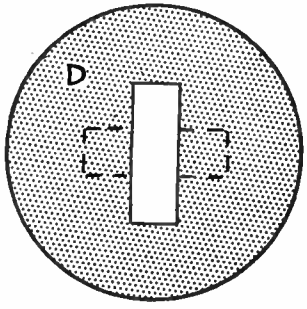
Glue the parts together and finish off by painting. (M.p.)











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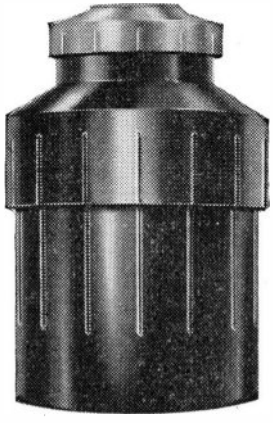

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